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**ERSA 2003 Congress****THE STUDY OF PERCEPTION AND PROJECT OF THE
TERRITORY USING BRAIN STORMING**

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ABSTRACT

The brainstorming is a method for identifies an idea oriented to the group. In brief is the conceptual analysis of the discussion inside a group. In this way is possible to free creative energies and develop new ideas. We propose an application in the field of urban planning. That is the research of a specific territory model different from the classical ones. By analysing the discussion between the students committed themselves in the elaboration of a social, economical, territorial document that has as object the Bergamo area we have tried to find a link between the various indicators and elements that identify the peculiar features of the territorial system that we study.

1 THE CONCEPTUAL MAPS (THE METHOD)

To express the knowledge often is complex, there is the risk to forget some aspects or not to explain things clearly. For this reason has been developed various visual techniques, such as mind mappings, conceptual mappings, cognitive mapping and in part even "clustering ", useful to help in understanding and organising the knowledge. The force of graphical techniques resides in helping to explicate, through ductile formal statements, reasoning and knowledge elements present in a confused way in our mind. They uses words, images, numbers, logic, colours, and are not simply pictures, they are instead the representation of reasoning, the exploration of a thought. (Guastavigna)

Maps, born at the beginning in psychological field, were used to revolution didactic and learning techniques, introducing an instruction method that included the active and collaborative learning (in which students resolve problems, answer to questions, make their own questions, discuss, explain, and debate).

Following this method a deeper and permanent level of comprehension is caught up, and are acquired abilities of critical and creative thought, and also a greater level of confidence in their own knowledge and skilfulness. Interaction with people, moreover, is nothing else than a method of collaborative learning. In every situation in which persons they are in group, exists, in fact, the better way to interact with the others, as far as in particular the abilities and the contributions or the roles of members of the group.

Even in working field the knowledge, implicit or explicit, by now is recognised like an essential element, as " the only meaningful economic resource ", and for this reason we have efforts and engage increasing resources in order to define how to reach, to represent, to capitalise, and to administrate it. For their nature maps are part of those instruments that support, guide and extend their user's process of thought.

A map evidences the knowledge of a person and permit to him to look inside himself and to understand his own experience, explaining therefore what is often implicit. Focal point for the construction of maps is their intrinsic dynamics, and for this reason, in different contexts and times, the representation can be really dissimilar.

There are various types of maps:

- Mind mappings;
- Conceptual mappings;
- Cognitive mapping.

1.1 Mind mappings:

The technique known as mind mapping has been developed from Tony Buzan in England: he simplified and published the ideas of Joseph Novak, (1993, university professor to the Cornell University), and made of mind mapping an organisational instrument and for supporting the memory. Mind mapping has only a main concept from which all the derivations and the associations are circulated, with hierarchical ramification (radial structure, association model): for this reason it can be represented from a tree structure, that identifies the expansion in detail of the main concept (look at figure 1). A mind mapping is in fact a representation of information and ideas connected one each others, where links are generally " liabilities ", and does not represent other that associations of ideas. In order to create a mind mapping it was traditionally necessary to use a great sheet of paper and many coloured pencils, you had to write the central idea in the centre of the sheet and let extend the visualised more important arguments through images, single words, or short and highly summarised topics. Now, as it happens also for development of other techniques that we will describe later, using the computer allow to create all this on a multimedia support, and in a increasing interesting and involving way.

1.2 Conceptual mapping:

The study of the technique known with the name of conceptual mapping began during the sixties with the Joseph's D. Novak studies (1993) at the Cornell University. His job was based on of David's Ausubel theories (1968) that emphasised the importance of the ability to learn new concepts. Conceptual mapping was born therefore for being able to formalise the structured knowledge: in other words the way in which several the concepts are correlated between them inside a determined cognitive dominion. From the first moment the technique of the conceptual mappings seems to be similar to that one known like " mind-mapping "; by the way the two techniques are different under many aspects, even if often the programs that serve for the creation of the conceptual mappings allow to develop even mind mappings. In the case of conceptual mappings, the graphical technique is used in order to represent the

knowledge through structuring a network of concepts, interconnected and correlated, (reticular structure, and connectivity model)

An other analogy that can be found is between conceptual mapping and the technique called clustering, a type of writing completely not structured that proceeds with free association of ideas; telling the truth conceptual mapping goes a step more ahead characterising clear relations between the ideas that are going to be written. Conceptual mapping, moreover, are more structured then the "pre-writing " and are more flexible then the formal approximated description, that puts ideas in sequence and organises them hierarchically by importance levels. Therefore, regarding the two previous techniques, conceptual mapping allow to see more complex relations between the ideas: with they concepts are introduced, not only hierarchical links, but making part of a system interconnected to the other concepts, through links entering and outgoing.

1.3 Cognitive mapping:

Later was developed a new different and more evolved technique, regarding the two previously illustrated ones, known with the name of cognitive mapping. It's based on the theory developed by Kelly (1955), that followed the approach introduced by Eden and Ackermann (Eden 1988, 1998, Ackermann ET al. 1992), in which ideas, represented by short phrases, are seen like concepts. As a difference between the two previous techniques, in fact, it doesn't use single words, but, where opportune, it inserts also a verb, to give a sense of action and a direction.

Here are indicated the main steps to follow during the construction a conceptual map:

- choose the goals that the map must illustrate;
- determine the fundamental concepts of the chosen argument listing them in one list;
- order the concepts in the list by importance and begin to put them in the map;
- begin to link the concepts, leaving to the end those between different hierarchical dominions;
- make corrections.

The steps in list above macroinstructions; every step can, in fact include, other different steps based on the argument of the concept.

1.4 Field of Application

The technique of construction and graphical representation of concepts by now is recognised like an irreplaceable instrument in many activities:

- to support decisions making ,
- in learning way and instruction,
- for documentation and research,
- in the brainstorming,
- in the strategic planning (to business level of territorial agencies, etc.),
- in the planning and development of products and processes, and in many other asset in the scholastic/academic, or research or professional fields.

There are some software that, once built the graphical model, allow making some useful analysis to represent the structure and the link in the map. The most important are:

1.5 Main analyses:

- DOMAIN ANALYSIS: The dominion analysis watches to the connection between the concepts, it analyses link in the first level, and that is immediately surrounding concept taken in consideration, calculating the number of link for towards (entering, outgoing, connotation), and in total.
- CENTRAL ANALYSIS: The central analysis makes a step in more regarding the previous analysis, in fact, beyond to the concepts of the first level, it considers also those concepts that are connected with that one considered in indirect way. This analysis moreover attributes a weight (equal to 1 for the link of the first level, about 1/2 for those of according to level, par to 1/3 for those of the third level and so on) to every link of distance, showing therefore the central of the considered concept. Otherwise from the dominion analysis it does not discriminate but against links.

- **CLUSTER ANALYSIS:** it is used in order to determine automatically, using algorithms of clustering, those concepts that are closely linked each other, and that typically cover a particular area of interest. It's even possible to visualise separately every cluster from the others order to print or revise it.
- **POTENCY ANALYSIS and HIESETS:** Hiesets and the potency analysis must be used together. The hiesets analysis must be realised as an example preliminarily on a set of given concepts (the set of the concepts "objective "). It identifies the hierarchical set of each analysed concept, that is a group of concepts influencing (in direct or indirect way) each analysed concept. The potency analysis serves, in consequence, in order to determine which is the most powerful concepts on our set of objectives, that is which concept succeed to influence, in direct or indirect way, the greater number of objectives.
- **LOOP ANALYSIS:** it allows characterising eventual contained cycles of positive or negative feedback in the model.

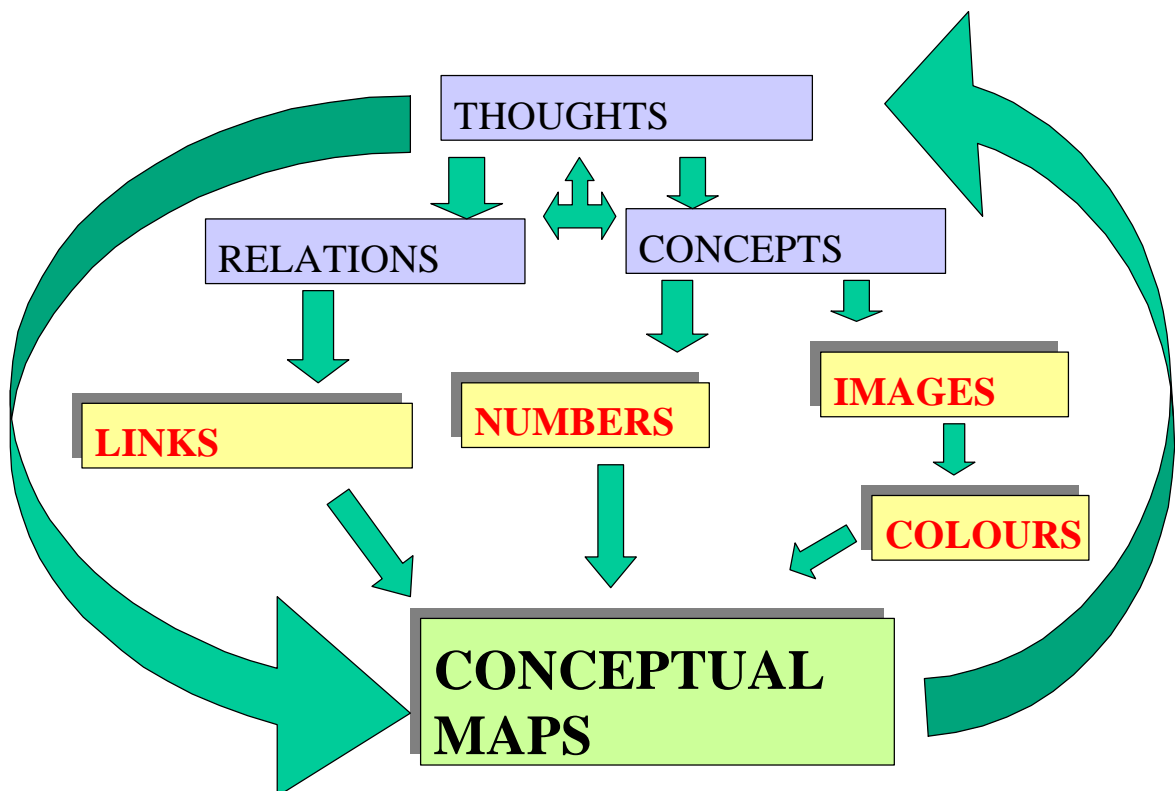


Figure 1: Conceptual map of conceptual maps

Decision Explorer, the freeware software used for this research, has some useful functions:

- possibility to import and to export a map
- visualisation of documents in more sheets, style Microsoft Excel;
- type, dimension, style and colour of the character; -
- shape;
- colour of the edge and of the background;
- possibility to personalise the style of the relations;
- colour;
- style of the line;
- style of the arrow;
- small messages of text in style memo;

Being a powerful instrument and really versatile, it is possible to use conceptual mapping, for many activities. They can carry out various tasks between which:

Instrument for the development of the creativity: how to design a conceptual mapping can be compared with participating to a session of " brainstorming ". Not hardly the ideas have to be put on paper, they become clearer, and the mind is free to receive something new. New ideas can be connected with those already present on the paper, giving the way to new associations. (Digest)

Instrument for the planning of Hypertexts: since the World Wide Web becomes a more and more powerful instrument in order to disseminate the information, writers had to adapt and convert from the writing of simple texts to the linked hypertext document writing form. The structural correspondence between the conceptual creation of hypertexts and maps make them an instrument adapted to the creation of the same ones. Either the hypertext structure or the conceptual mappings one would be seen as a tidy diagram or a diagram of the knowledge. A conceptual mapping put on the Web, as hypertext can also be useful as a navigation instrument, if there are areas on which you can click that immediately carry the customer in specific parts of the site. They give the opportunity to amplify the cognitive potentialities of who constructs the map, integrating hyperlink to multimedia objects and coming from resources from the Internet. This possibility allows to extend the classic use of the maps to the planning of hypertext/multimedia applications, strengthening therefore the consciousness of the

knowledge joined to the ability to understand, to control and to manipulate the cognitive processes. (Digest)

Instrument for the communication: a conceptual mapping allows explicating reasoning and knowledge pertaining to various actors, giving them the possibility to communicate in a simpler and directed way.

Instrument for learning: the first Novak's job faced the topic of learning. The theory of the constructive learning asserts that the new knowledge would have to be integrated with the existing structures, therefore from being able to be remembered and to mean something. The conceptual mapping stimulates and explicates this process and demand learning to pay attention to the relations between the concepts. Jonassen (1996) asserts that the students show their " better thoughts " when they represent them graphically, and thinks that it's a necessary condition in order to learn. Some experiments in the tests have shown that subjects that use the conceptual mapping have better performances than those do that do not use them. The conceptual mapping is used even in education as an instrument in order to solve problems, generating new alternatives and option. (Digest) ·

Instrument for the appraisal: the group of search that placed side by side to Joseph Novak at the Cornell University found that an other use of conceptual mapping was its ability in discovering or to illustrate an incomprehension that the students can find. The students' knowledge is often incomplete and lacking because of the misunderstandings that the instruction provokes. The conceptual mapping created from the same students express instead their knowledge of the argument (or what they have not understood about it), and helps teaching to make a diagnostic (Ross & Munby, 1991). (Digest)

Instrument to formalise the knowledge: a conceptual mapping is a powerful instrument through which you can represent in graphical way the acquired knowledge, creating a formalised structure. In the territorial planning sciences, conceptual mapping can moreover be used, in the field of planning, in order to represent, through it are diagrams of stock and flow or processing diagrams, as well as the physical phenomena as the social-economic ones.

2 THE “BERGAMASCA” SYSTEM

The goal of the research is the construction of a specific territorial model different from the classical theories. Through the analysis of the discussion engaged between the students that have elaborated a territorial, social and economic relation, that has as object the zone of Bergamo, we have attempted to find the links between several indicators and elements in order to characterise the peculiar dynamics of the territorial system in object.

2.1 Brain Storming

The concepts and the elements for the construction of the maps have been acquired directly through the analysis of a debate between the students involved in the socio-economic territorial and environmental research (S.E.T.A. report) having Bergamo as object area.

The S.E.T.A. report has been realised developing 44 specific themes distributed in 6 thematic areas (Territory & transportation, Social, Services, Culture, Environment, Production).

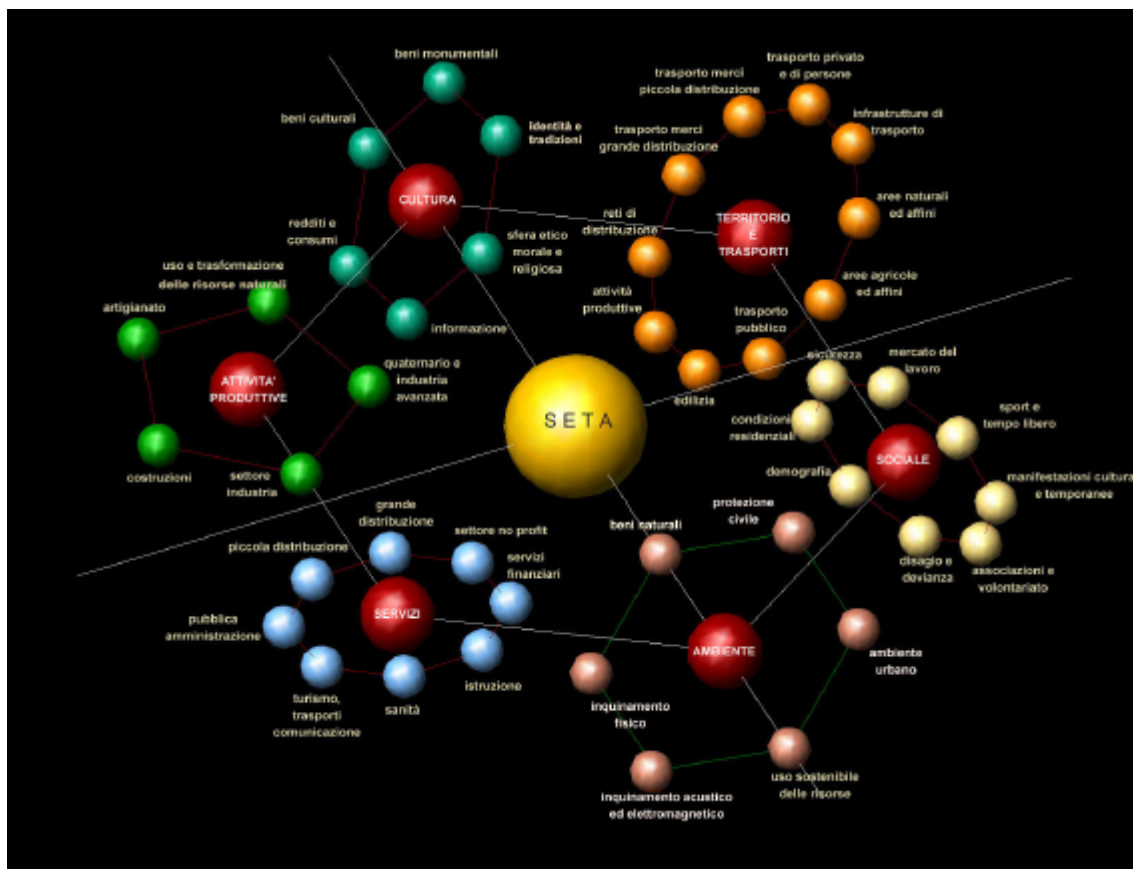


Figure 2: S.E.T.A. Report structure

To give a first evaluation of the links, we have asked to the students involved in the research to express an affinity judgement between the themes of the S.E.T.A. report.

The result is a matrix of the relations that we have used to build the links on the map.

		Production					Services								Territory & Transportation									
		Landuse	Factories	Handicrafts	Buildings	Information technology	Large distribution	Small distribution	finance	education	health	turism	Public administration	no profit	public transportation	private transportation	large distribution	Small distribution	Transportation Infrastructure	Buildings	distribution network	Factories areas	Agriculture	Natural areas
Production	Landuse	0	3	7	3	7	9	9	9	9	9	5	9	9	9	9	9	9	7	9	5	5	3	1
	Factories	3	0	2	4	2	9	9	4	9	9	9	5	9	5	7	1	3	4	3	3	1	9	9
	Handicrafts	7	2	0	2	5	7	3	5	7	9	4	9	9	9	5	5	3	5	4	7	3	7	9
	Buildings	3	4	2	0	9	9	9	7	7	7	9	7	9	9	9	5	7	7	1	9	5	7	7
	Information technology	7	2	5	9	0	7	3	3	3	9	7	9	9	9	9	4	1	4	9	4	1	9	9
Services	Large distribution	9	9	7	9	7	0	1	9	9	9	9	9	9	3	7	1	9	4	9	5	7	7	9
	Small distribution	9	9	3	9	3	1	0	9	9	9	9	9	9	7	7	7	3	3	9	7	7	9	9
	finance	9	4	5	7	3	9	9	0	9	9	9	7	9	9	9	9	9	9	9	9	5	9	9
	education	9	9	7	7	3	9	9	9	0	9	7	5	7	3	4	9	9	7	7	9	5	9	7
	health	9	9	9	7	9	9	9	9	9	0	9	5	7	7	7	9	9	7	7	9	7	9	9
	turism	5	9	4	9	7	9	9	9	7	9	0	5	9	2	2	3	7	2	9	9	9	4	1
	Public administration	9	5	9	7	9	9	9	7	5	5	5	0	4	7	9	7	7	7	5	9	5	5	3
	no profit	9	9	9	9	9	9	9	9	7	7	9	4	0	9	9	9	9	9	9	9	9	9	7

Figure 3: matrix of the relations

This is the first step to represent the “Bergamasca” system.

The analysis of the themes contents allowed characterising some kinds of concepts.

The concepts are not quantitative but they comprise problematic, and mutual correspondences that illustrate the Bergamo’s situation, moreover well described inside of every single part of the report S.E.T.A..

For the character of specificity and peculiarity of the territory, these data are fundamental to take a picture of Bergamo situation.

Between the several categories of concepts we find the “heads” in which does not enter no link, others are the “tails” from which does not exit no link.

In particular they are ending concepts that are goals, realised projects, unresolved problems.

Beyond to the position of the concepts it is important to make of a classification that allows a graphical differentiation to give an immediate interpretation.

For this reason much time has been dedicated to the analysis of each concept, therefore to be sure to characterise in one way the character that they have inside of the map.

In the compilation of the conceptual map is very important the graphical garment.

To take advantage from the potentialities of such representation it must be possible to immediately distinguish the type of element, link or concept observed.

The defined styles are:

Conseguenze dirette

DIRECT CONSEQUENCES: Implies that the concept is a direct consequence of the previous concept that is the one from which starts the link that ended here.

Elementi sociologici

SOCIOLOGIC ELEMENTS: elements related to the report between people and community.

Freni allo sviluppo

PREVENT TO DEVELOPMENT: related to land use

Problemi evidenti

EVIDENT PROBLEMS:

Elementi Economici

ECONOMIC ELEMENTS:

Input di sviluppo

DEVELOPMENT INPUT: elements that can provoke a development growth.

Elementi Ambientali

ENVIRONMENTAL ELEMENTS: Elements related with environment.

Interventi Richiesti

REQUIRED INTERVENTION: Intervention for the resolutions of important problems, strongly required.

**Interventi Già
Realizzati**

REALISED INTERVENTION: Intervention recently realised and very important for the “Bergamasca” system.

It is now possible to comment the main reasoning that are followed for the creation of the “Bergamasca” system and analyse the more important results that we have obtained

2.2 The results

The Conceptual Map born from the debate is complex and not immediately comprehensible. That depends on the great amount of concepts and links that it expresses.

Analysing the complexity of the map it is easy to recognise the thematic areas that characterise the "Bergamasca" system. Those areas can be analysed separately.

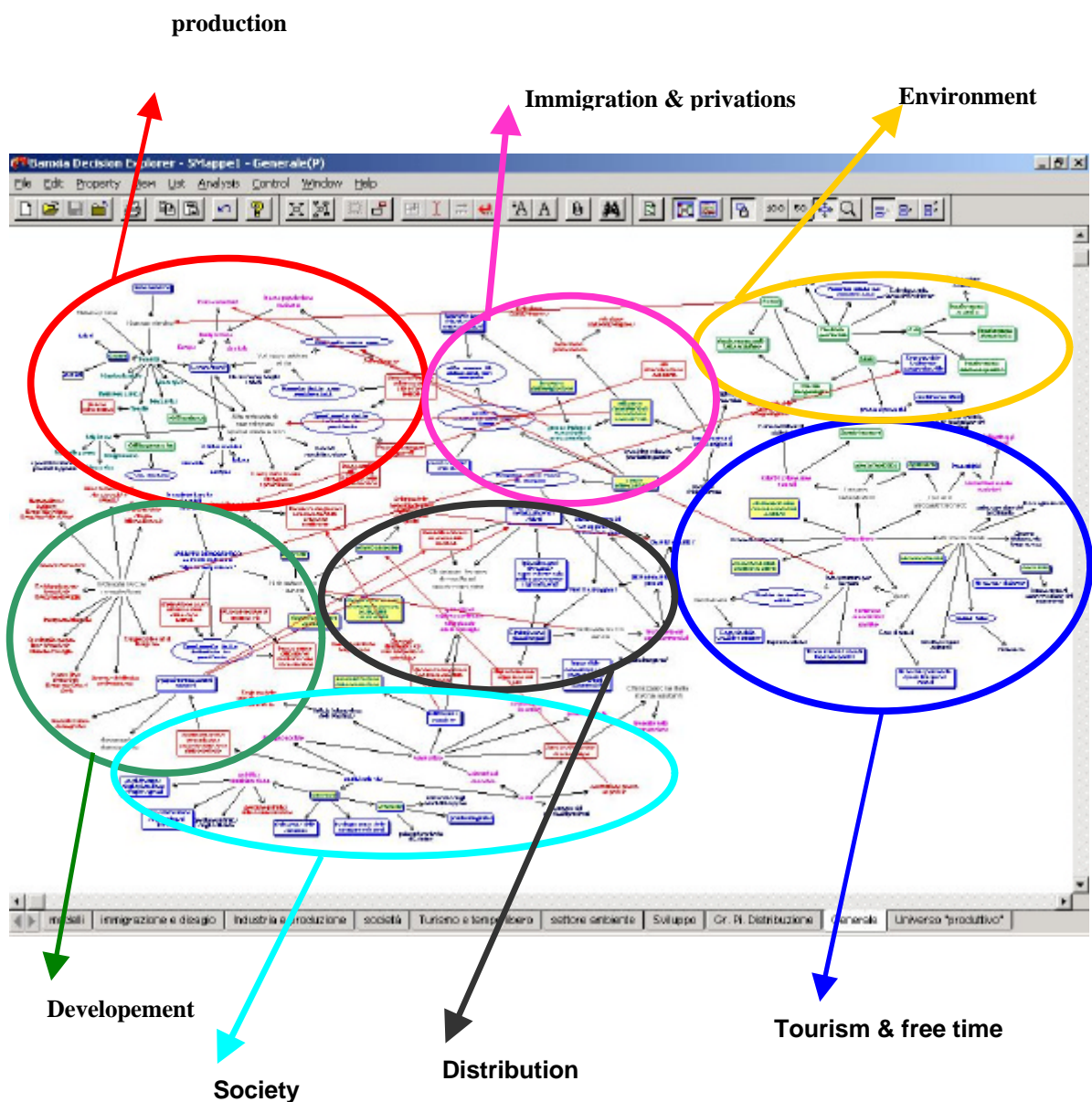


Figure 4: "Bergamasca" system conceptual map

The subgroups that emerge are:

- society;
- environment;
- immigration and uneasiness;
- tourism and free time;
- industry and production;
- large & small distribution;
- Development.

The SW banxia has allowed executing many analysis to interpret the map. For example the picture 5 show an analysis and the loop between the following concepts: immigration, black job, new resident, houses demand, building development. The central analysis shows that the central concept is industry & production.

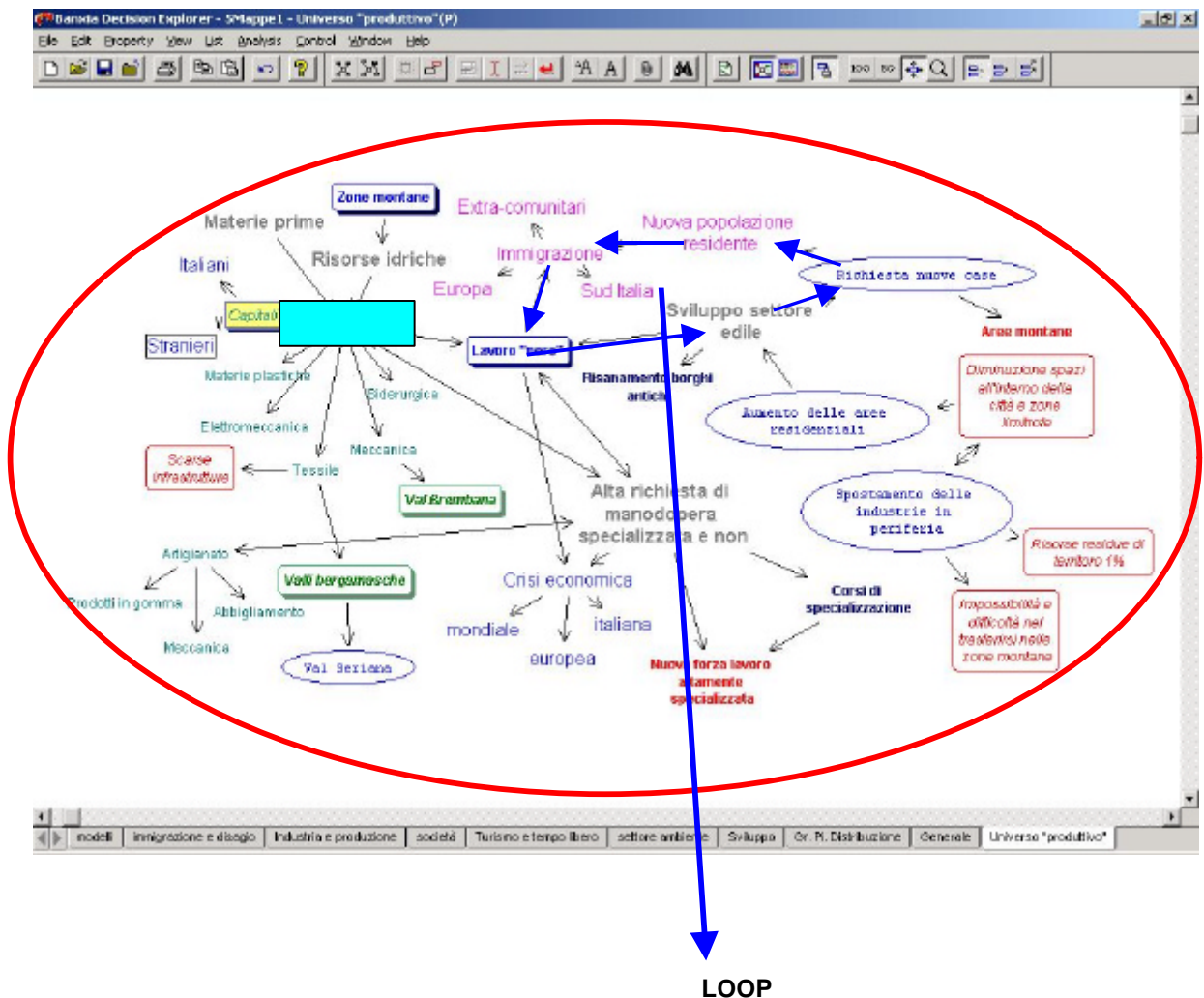


Figure 5: Example of analysis

The concepts more linked with the others are demand for new infrastructures, demand for new services, birth and development of the small industries, micro crime, quality of the life, tourism, free time and new population resident.

The concepts less linked are raw materials, water, and characteristic resources of the territory.

For every subgroup has been created a map and then it has been analysed.

For example the society map tries to analyse the quality of the life in the territory of Bergamo. The quality of life is a very important concept, and is the centre of several considerations in the analysis.

From the analysis of the services (health services, educational services, etc) we notice that there are many differences from the city to the countryside. The problems, in the countryside is logistic and infrastructures. This constitute an obstacle for development.

On the other side we can observe that in the Province of Bergamo there are many social no-profit associations that try to give an alternative service and that born from a real necessity of the population.

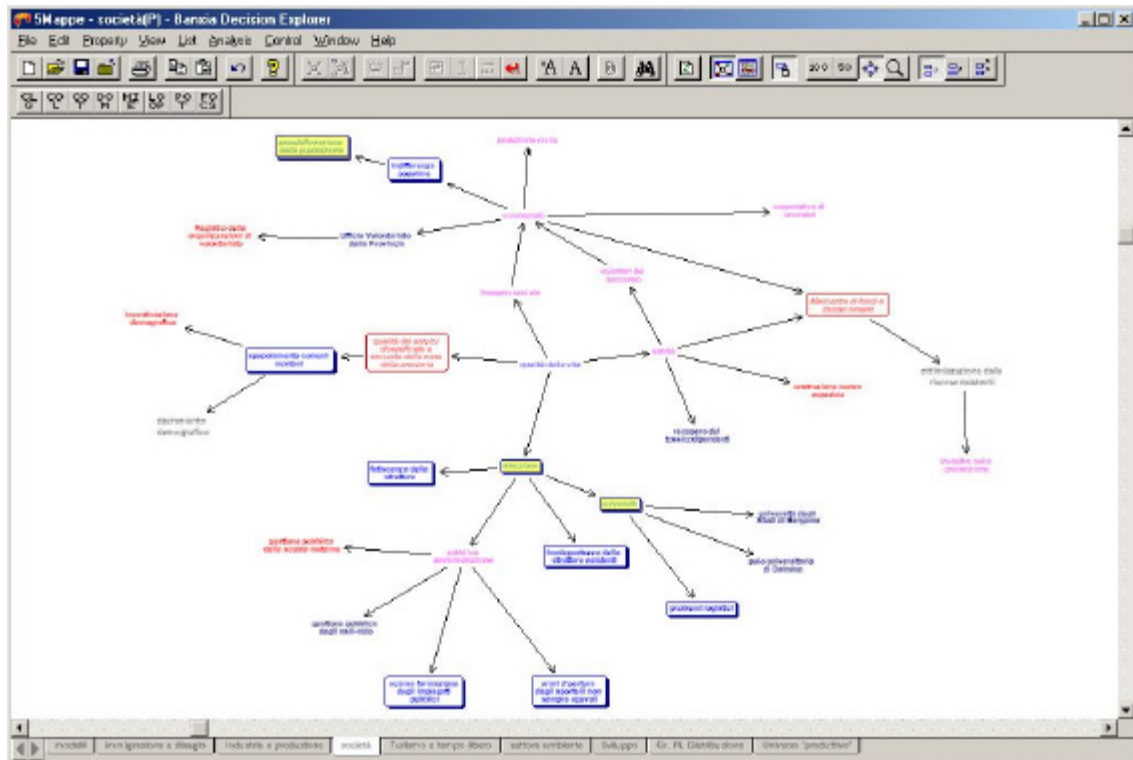


Figure 6: Society map

3 CONCLUSION

The goal of this research was not to build the model of the "Bergamasca" system, but to test the potentialities of conceptual mapping in the field of urban planning.

This experience has pointed out some peculiarity of conceptual mapping that can be useful for the study of the territory:

- It is a method to extract unstructured knowledge and to develop the creativity: when the ideas have to be put on paper, they become clearer, and the mind is free to receive something new.
- It is a tool for the communication: the conceptual mapping allows explicating reasoning and knowledge pertaining to various actors, giving them the possibility to communicate in a simpler and direct way. In this way conceptual maps can be very useful in public debates concerning the urban planning.

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